E34-2G4H11S Datasheet

2.4GHz TTL automatic frequency hopping wireless module

Content

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Chapter 1 Product Overview

1.1 Product Introduction

E34-2G4H11S is a wireless data transmission module, operating in the 2.4~2.518GHz frequency band, half-duplex, TTL level output, using serial port for data transceiver, reducing none The threshold of line application.

E34-2G4H11S has the characteristics of automatic frequency hopping function, strong anti-interference ability, high transmission rate and small delay;   Automatic frequency hopping technology is to ensure the confidentiality and anti-interference of communication, compared with fixed frequency communication, frequency hopping communication is relatively hidden and difficult to be intercepted. Frequency hopping communication also has good anti-interference ability, even if some frequency points are interfered with, normal communication can still be carried out on other uninterfered frequency points.

1.2 Features and functions

- Support automatic frequency hopping, greatly improve the communication anti-interference ability;
- Support fixed frequency communication, fast transmission speed, low latency;
- Support automatic retransmission of packet loss;
- Support fixed-point transmission, easy to network communication;
- Maximum emission power 13mW, flexible multi-stage adjustable;
- Support for the global license-free ISM 2.4GHz band;
- Support air rate 250k~2Mbps;
- Support advanced GFSK modulation mode;
- Support 2.5~3.6 V power supply, greater than 3.3V power supply can ensure the best performance;
- Industrial standard design, support -40 ~ +85 °C at long-term use;
- PCB onboard antenna, built-in antenna no need for external antenna.

1.3 Scenarios

- Wearable devices;
- Smart home and industrial sensors, etc.;
- Security system, positioning system;
- Wireless remote control, drone;
- Wireless gaming remote control;
- Healthcare products;
- Wireless voice, wireless headphones;
- Automotive applications.

Chapter 2 Specifications

2.1 Limit parameters

The main parameters	performance		remark
	minimum	maximum	
Supply voltage (V).	2.5	3.6	Permanently burns modules over 3.6V
Blocking power (dBm).	-	10	The probability of burning at close range is small
Operating temperature (°C).	-40	+85	Industrial grade

2.2 Working parameters

The main parameters		performance			remark
		minimum	Typical value	maximum	
Operating voltage (V).		2.5	3.3	3.6	≥3.3V guaranteed output power
Communication level (V).			3.3		
Operating temperature (°C).		-40	-	+85	Industrial-grade design
Operating frequency band (MHz).		2400	-	2518	ISM bands are supported
power consumption	Emission current (mA).		50		Instantaneous power consumption
	Receive current (mA).		23		
	Sleep current (μA).		3		The software shuts down
Maximum transmit power (dBm).		10.5	11.0	11.5	
Reception sensitivity (dBm).			-90		The air speed is 250kbps
Air rate (bps).		250k	250k	2M	The higher the air rate, the shorter the communication distance

The main parameters	description	remark
The reference distance	130m	Sunny and open environment, antenna height of 2.5 meters, air speed 250kbps
Subcontracting	27 Btye	Maximum length of a single send
Cache capacity	256 Btye	
Modulation mode	GFSK	
Communication interface	UART serial port	TTL level
Encapsulation mode	SMD	
Interface mode	1.27mm	
Dimensions	12*19mm	
Antenna interface	PCB onboard antenna	The equivalent impedance is approximately 50Ω

Chapter 3 Mechanical Dimensions and Pin Definitions
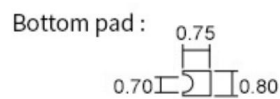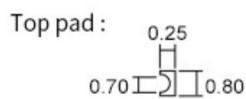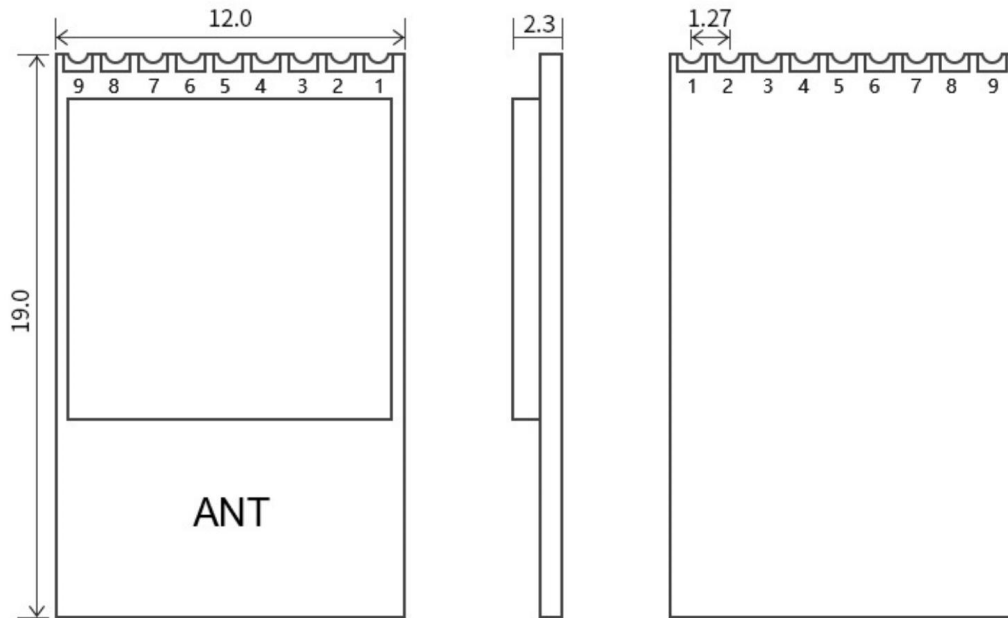
Pin serial number	Pin name	Pin orientation	Pin use
1	M0	Input (very weak pullup)	In conjunction with M1, the module is determined by 4 modes of operation (not dangling, if not used grounded).
2	M1	Input (very weak pullup)	In conjunction with M0, the module is determined by the four modes of operation (not dangling, if not used grounded).
3	RXD	input	TTL serial input, connected to an external TXD output pin.
4	TXD	output	TTL serial output connected to an external RXD input pin.
5	AUX	output	Used to indicate the operating status of the module (can be suspended) The user wakes up the external MCU and outputs a low level during power-on self-test initialization.
6	VCC		The module power supply is positive reference with a voltage range of 2.5 to 3.6V DC
7	GND	input	Module ground
8	RESET	input	Module reset pin, active low
9	NC		Reserved feet

Chapter 4 Recommended Connection Diagram
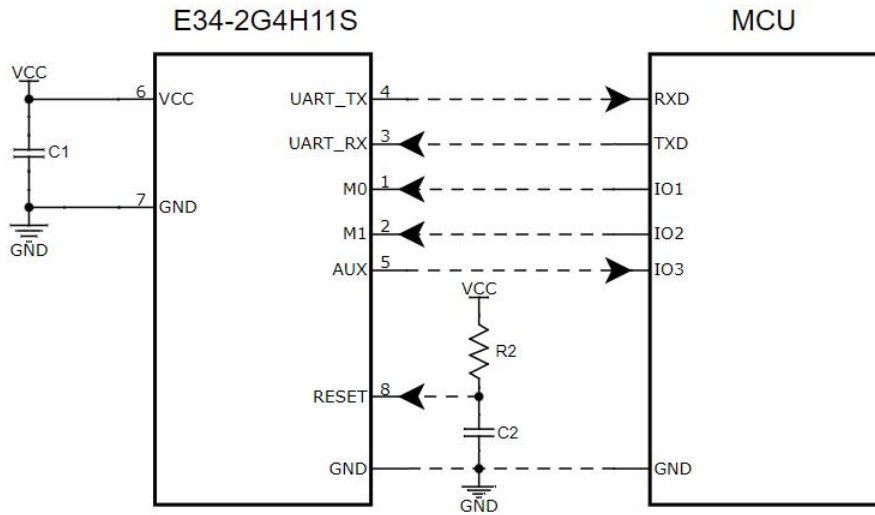
Chapter 5 Detailed Explanation of Functions

5.1 Fixed-point transmission
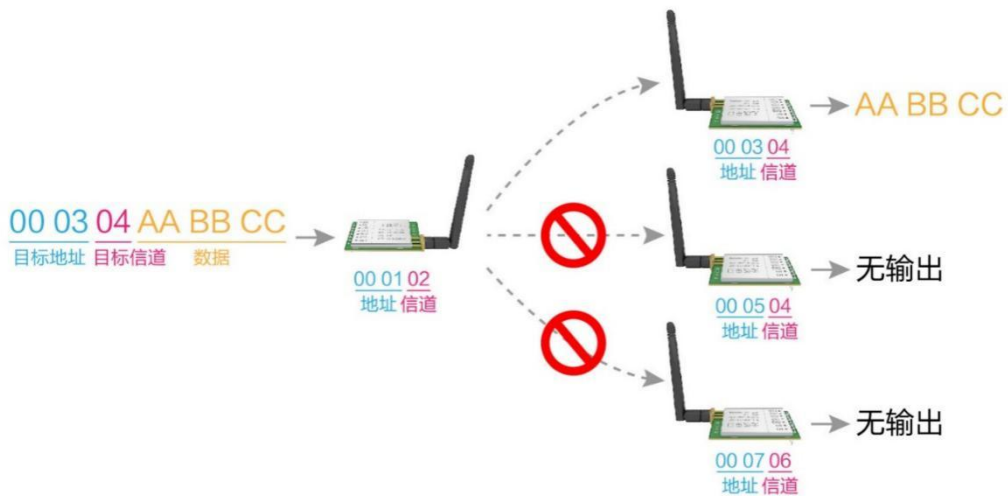
5.2 Module reset

- After the module is powered on, the AUX will immediately output a low level, and perform hardware self-test, as well as set the working mode according to user parameters;

  In this process, AUX remains low, after which AUX outputs high and starts working normally according to the working mode formed by M1 and M0;

  Therefore, the user needs to wait for the AUX rising edge as the starting point for the normal operation of the module.

## 5.3 AUX Details

- AUX for wireless sending and receiving buffer indication and self-test indication;
- It indicates whether the module has data that has not been transmitted wirelessly, or whether the wireless data that has been received has not yet been sent out in its entirety through the serial port, or whether the module is in the process of initializing the self-test.

5.3.1 Serial port data output indication

- Used to wake up an external MCU in hibernation;
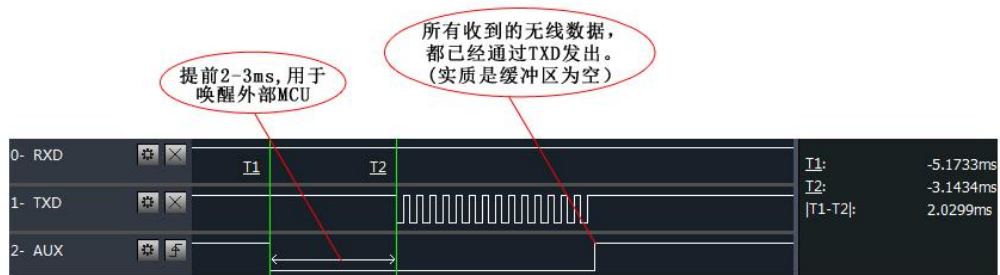
模块串口外发数据时，AUX引脚时序图

5.3.2 Wireless transmit indication

- Empty buffer: The data in the internal 256-byte buffer is written to the wireless chip (automatic subparsing). When AUX=1 the user continuously initiates less than 256 bytes of data without overflowing;

  When AUX=0, the buffer is not empty: the data of the internal 256-byte buffer has not yet been written to the wireless chip and the transmission is turned on, at this time the module may be waiting for the user data to end the timeout, or the wireless packet transmission is in progress;

  【Note】:AUX=1 does not mean that all the serial port data of the module has been transmitted wirelessly, and the last packet of data may be transmitted.
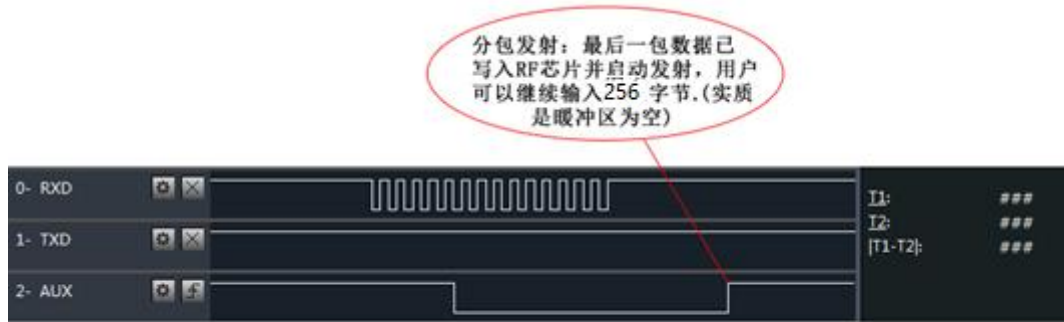
模块接收串口数据时，AUX引脚时序图

5.3.3 The module is in the process of configuration

- Only when resetting and exiting sleep mode;
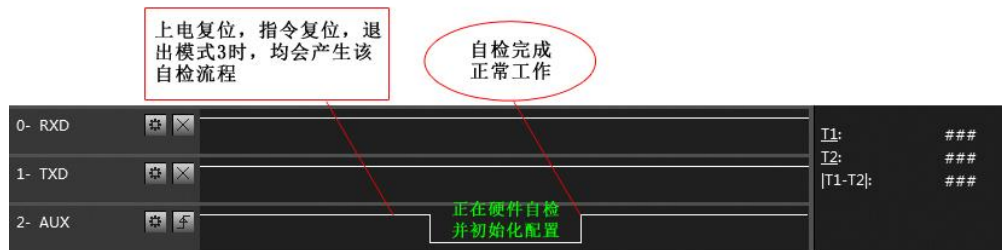
自检期间，AUX引脚时序图

5.3.4 AUX Considerations

- Function 1 and function 2 above, the output low level is preferred, that is, if any one of the output low conditions is met, the AUX output low level;   The AUX outputs high when all low conditions are not met.
- When the AUX output is low, it means that the module is busy, and the working mode detection will not be carried out at this time; When the AUX output of the module is high within 1ms, the mode switching work will be completed.
- After the user switches to the new working mode, at least 2ms after the AUX ascending edge is required for the module to actually enter the mode; If the AUX is consistently high, then the mode switching will take effect immediately.
- The user enters another mode from mode 3 (sleep mode) or during the reset process, the module resets the user parameters, during which the AUX output is low.

Chapter VI Working Mode

The module has four operating modes, set by pins M0 and M1; The details are shown in the following table:

Mode (0-3).	M0	M1	Introduction to the pattern	remark
0 Fixed frequency mode	0	0	The serial port is opened, the wireless is turned on, and the transmission is transparent	The receiver must be modes 0 and 2
1 Frequency hopping mode	1	0	and mode 0 difference: The module will be based on certain algorithm rules, the frequency will change during the sending and receiving process, the range of change is not limited to the basic frequency point set by the user, the module has a specific spread spectrum sequence.	The receiver must be Mode 1
2 Reservation mode	0	1	Reservation mode	Temporarily the same as mode 0
3 Sleep mode	1	1	The module goes to sleep and can receive parameter setting commands	See the working parameters for details

6.1 Mode switching

●   The user can combine M1 and M0 with high and low levels to determine the working mode of the module;

2 GPIOs of the MCU can be used to control mode switching;

When changing M1 and M0: If the module is idle, after 1ms, you can start working according to the new mode;

If the serial port data of the module has not been transmitted through the wireless, the new working mode can only be entered after the transmission is completed;

If the module receives wireless data and sends data out through the serial port, it needs to be sent before it can enter the new working mode;

So the mode switch can only be valid when AUX outputs 1, otherwise the switch will be delayed.

●   For example, in mode 0 or mode 1, the user continuously enters a large amount of data and switches modes at the same time, and the switching mode operation at this time is invalid;

The module will process all user data before performing new pattern detection;

Therefore, the general recommendation is: check the AUX pin output status, wait for the AUX output high level and then switch for 2ms.

6.2 Fixed frequency mode (mode 0).

type	When M0 = 0 and M1 = 0, the module operates in mode 0
launch	The module receives user data from the serial port, the module transmits wireless packets with a length of 27 bytes, when the user input data reaches 27 bytes, the module will start wireless transmission, at which time the user can continue to input the data that needs to be transmitted; When the bytes that the user needs to transmit are less than 27 bytes, the module waits for 3 bytes of time, if no user data continues to be entered, the data is considered to be terminated, and the module will send all packets through the wireless; When the module receives the first user data, the AUX output is low, and when the module puts all the data into the RF chip and starts the transmission, the AUX output is high; At this point, it indicates that the last packet of wireless data has started the transmission, and the user can continue to enter up to 256 bytes of data; Packets sent through mode 0 can only be received by receiving modules in mode 0 and mode 2.

reception	The module has been turned on the wireless receiving function, which can receive packets from mode 0 and mode 2; After receiving the packet, the module AUX output is low, and after a delay of 5ms, the wireless data begins to be emitted through the serial port TXD pin, and after all the wireless data is output through the serial port, the module outputs the AUX high.
note	When a module transmits data, it cannot receive data. At the same time, when the module receives data, it cannot send data.

6.3 Frequency hopping mode (mode 1).

type	When M0 = 1 and M1 = 0, the module operates in mode 1
launch	The conditions for module initiation packet transmission and AUX function are equivalent to mode 0, the only difference is that the module will change according to certain algorithm rules, and the frequency will change during the sending and receiving process. The range of variation is not limited to the user-set base frequency point. The module has a specific spread spectrum sequence. The user does not need to care about this sequence. Packets sent through Mode 1 can only be received by receiving modules in Mode 1.
reception	Equivalent to mode 0, the only difference is that the module can only receive packets from mode 1.
note	When a module transmits data, it cannot receive data. At the same time, when the module receives data, it cannot send data.

6.4 Reservation mode (mode 2).

type	When M0 = 0 and M1 = 1, the module operates in mode 2
launch	Equivalent to mode 0.
reception	Equivalent to mode 0.

6.5 Sleep mode (mode 3).

type	When M0 = 1 and M1 = 1, the module operates in mode 3
launch	Wireless data cannot be transmitted.
reception	Unable to receive wireless data.
disposition	Sleep mode can be used for module parameter setting, using serial ports 9600, 8N1, through a specific instruction format to set the module working parameters.
note	When entering from the setup mode to other modes, the module will reconfigure the parameters, and during the configuration process, the AUX remains low; The output is high when finished, so it is recommended that the user detect the rising edge of the AUX.

6.6 Fast Communication Test

steps	Specific operations

1	Plug the USB test board (E15-USB-T2) into the computer to ensure that the driver is installed correctly; Plug in the mode selection jumper on the USB test board (i.e. M1=0, M0=0).
2	Choose 3.3V power supply (module supports 2.5 to 3.6V).
3	Run the "Serial Debugging Assistant" software, select the correct serial slogan, observe the sending window and the corresponding receive window.
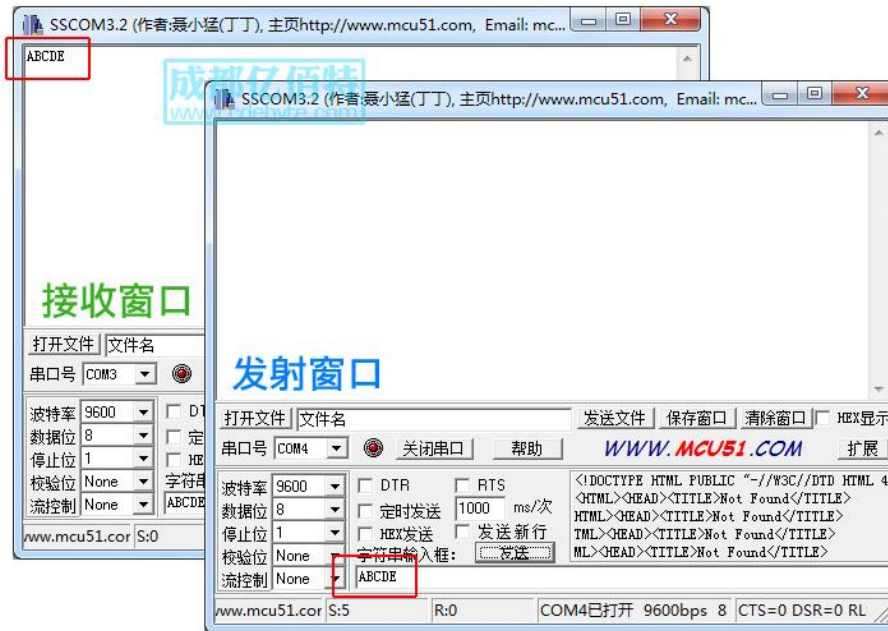
Chapter 7 Instruction Formats

● In the setting mode (mode 3: M0=1, M1=1), the list of supported instructions is as follows (**when setting, only 9600, 8N1 formats** are supported):

serial number	The directive format	Detailed instructions
1	C0+ operating parameters	The hexadecimal format sends C0+5 bytes of working parameters, a total of 6 bytes, which must be sent continuously (power-down saving).
2	C1+C1+C1	Three C1s are sent in hexadecimal format, and the module returns saved parameters, which must be sent continuously.
3	C2+ operating parameters	The hexadecimal format sends C2+5 bytes of working parameters, a total of 6 bytes, which must be sent continuously (power down is not saved).
4	C3+C3+C3	Three C3s are sent in hexadecimal format, and the module returns version information, which must be sent consecutively.
5	C4+C4+C4	Three C4s are sent in hexadecimal format, and the module will produce a reset that must be sent continuously.

7.1 Factory default parameters

Model	Factory default parameter value: C0 00 00 18 00 40						
Module model	frequency	address	channel	Air rate	baud rate	Serial port format	Transmit power

E34-2G4H11S	2.4GHz	0x0000	0x00	250kbps	9600	8N1	13mW

7.2 Reading working parameters

The directive format	Detailed instructions
C1+C1+C1	In sleep mode (M0=1, M1=1), issue a command (HEX format) to the module serial port: C1 C1 C1 The module returns the current configuration parameters, such as: C0 00 00 18 00 40.

7.3 Version number read

The directive format	Detailed instructions
C3+C3+C3	In setup mode (M0=1, M1=1), issue a command (HEX format) to the module serial port: C3 C3 C3 The module returns the current configuration parameters, such as: C3 39 xx yy; The 39 here represents the module model (E39 series), xx is the version number, and yy refers to other features of the module.

7.4 Reset instructions

The directive format	Detailed instructions
C4+C4+C4	In setup mode (M0=1, M1=1), issue a command (HEX format) to the module serial port: C4 C4 C4 The module will generate a reset; During the reset process, the module self-tests, the AUX output is low, after the reset is completed, the AUX output is high, and the module begins to work normally. At this point, you can switch modes or initiate the next command.

7.5 Parameter setting instructions

	name	description			remark
0	HEAD	Fixed 0xC0 or 0xC2 indicating that this frame data is a control command			Must be 0xC0 or C2 C0: The set parameters will be saved by power-down. C2: The set parameter will not be saved by power loss.
1	ADDH	7, 6, 5, 4 Number of packet loss retransmissions (only modes 0 and 2 are valid).			Default 15 times (default F); When there are multiple receivers with the same address, a conflict may occur, please set it to 0
		3, 2, 1, 0 module address 4 bits higher (default F0H).			The default is 0
2	ADDL	The module address is low bytes (default 00H).			00H-0FFH
3	SPED	7	6	Serial port check bit	The serial port mode of both sides of the communication can be different
		0	0	8N1 (default).	
		0	1	8O1	
		1	0	8E1	
		1	1	8N1 (equivalent to 00).	
		5	4	3 TTL serial port rate (bps).	The baud rate of both sides of the

		0	0	0	The serial port baud rate is 1200	communication can be different ；
		0	0	1	The serial port baud rate is 2400	
		0	1	0	The serial port baud rate is 4800	The serial port baud rate is independent of the wireless transmission parameters and does not affect the wireless transceiver characteristics.
		0	1	1	The serial port baud rate is 9600 (default).	
		1	0	0	The serial port baud rate is 19200	
		1	0	1	The serial port baud rate is 38400	
		1	1	0	The serial port baud rate is 57600	
		1	1	1	The serial port baud rate is 115200	
		2	Leave unused			It is recommended to write 0
		1	0	Wireless air rate (bps).		The over-the-air wireless transmission rate of both parties to the communication must be the same;
		0	0	Air-to-air rate of 250k (default).		
		0	1	Air speed 1M		
		1	0	Airborne velocity 2M		
		1	1	The airborne velocity is 2M (equivalent to 10).		The lower the air rate, the farther the distance, the stronger the anti-interference performance, and the longer the transmission time.
4	CHAN	7, 6, 5, 4 Reserved unused				It is recommended to write 0
		3, 2, 1, 0 communication channels				00H~0BH, a total of 12 channels;
		Fixed frequency mode (mode 0). 0-5 channel corresponding frequency: 2400M + CHAN * 2M 6-11 channel corresponding frequency: 2508M+ (CHAN-6)*2M Frequency hopping mode (mode 1). 0-11 channel corresponding frequency: 2412M + CHAN * 2M				
5	OPTION	7	Fixed-point transmit enable bits (MODBUS-like).			When 1, the first 3 bytes of each user data frame are used as high, low addresses, and channels. When launching, the module changes its own address and channel, and when it is finished, it restores the original settings.
		0	Transparent transmission (default)			
		1	Fixed-point transmission			
		6, 5, 4, 3, 2 Reserved unused				It is recommended to write 0
		1	0	Transmit power (approximate).		The external power supply must provide more than 800mA current output capability and ensure that the power supply ripple is less than 100mV; Lower power transmission is not recommended and its power utilization efficiency is not high.
		0	0	11dBm (default).		
		0	1	7dBm		
		1	0	3dBm		
		1	1	-1dBm		

Illustrative example (meaning of the ordinal number 3 "SPED" byte):								
The binary bit of the byte	7	6	5	4	3	2	1	0
Specific values (user configuration)	0	0	0	1	1	0	0	0
Represents meaning	The serial port check bit is 8N1			The serial port baud rate is 9600			Air speed 250kbps		
The corresponding hexadecimal	1				8				

Chapter 8 Hardware Design

- It is recommended to use a DC regulated power supply to power the module, the ripple coefficient of the power supply is as small as possible, and the module needs to be reliably grounded;

- Please note that the correct connection of the positive and negative poles of the power supply, such as reverse connection, may

cause permanent damage to the module;

- Please check the power supply to ensure that between the recommended supply voltages, if the maximum value is exceeded, the module will be permanently damaged;

- Please check the stability of the power supply, the voltage can not fluctuate greatly and frequently;

- When designing the power supply circuit for the module, it is often recommended to retain more than 30% of the margin, and the whole machine is conducive to long-term stable work;

- The module should be as far away as possible from the power supply, transformer, high-frequency traces and other parts of electromagnetic interference;

- High-frequency digital trace, high-frequency analog trace, power routing must avoid the module below, if you really need to go through the module below, assuming that the module is soldered in the top layer, the top layer of the module contact part of the copper (all copper and well grounded), must be close to the digital part of the module and the wire is routed in Bottom Layer；

- Assuming that the module is welded or placed in the Top Layer, it is also wrong to arbitrarily route the Bottom Layer or other layers, which will affect the spurious and receiving sensitivity of the module to varying degrees;

- Assuming that there are devices with large electromagnetic interference around the module, it will also greatly affect the performance of the module, and it is recommended to be appropriately away from the module according to the intensity of the interference, and if the situation allows, appropriate isolation and shielding can be done;

- Assuming that there are large electromagnetic interference traces (high-frequency digital, high-frequency analog, power supply traces) around the module will also greatly affect the performance of the module, and according to the intensity of the interference, it is recommended to be appropriately away from the module, and if the situation allows, appropriate isolation and shielding can be done;

- If the communication line uses 5V level, it must be connected in series with 1k-5.1k resistors (not recommended, there is still a risk of damage);

- Try to stay as far away from the TTL protocol that is also 2.4GHz in some physical layers, such as USB3.0;

- When the module is installed inside the chassis, a high-quality antenna extension cord can be used to extend the antenna to the outside of the chassis and preferably vertically upwards.

Chapter 9 Frequently Asked Questions

9.1   The transmission distance is not ideal

- When there is a linear communication obstacle, the communication distance will be attenuated accordingly;

- Temperature, humidity, and the same frequency interference will lead to increased communication packet loss rate;

- The ground absorbs and reflects radio waves, and the test effect near the ground is poor;

- Seawater has a strong ability to absorb radio waves, so the seaside test effect is poor;

- If there is a metal object near the antenna, or placed in a metal shell, the signal attenuation will be very serious;

- The power register is set incorrectly, the air rate is set too high (the higher the air rate, the closer the distance);

- The low voltage of the power supply at room temperature is lower than the recommended value, and the lower the voltage, the smaller the power;

- The antenna used matches the module poorly or the quality of the antenna itself is a problem.

9.2 The module is easily damaged

- Please check the power supply to ensure that between the recommended supply voltages, if the maximum value is exceeded, the module will be permanently damaged;
- Please check the stability of the power supply, the voltage can not fluctuate greatly and frequently;
- Please ensure that the installation and use of the process of anti-static operation, high frequency device static sensitivity;
- Please ensure that the humidity during installation and use should not be too high, some components are humidity sensitive devices;
- If there is no special demand, it is not recommended to use it at too high or too low temperatures.

9.3 The   bit error rate is too high

- There is co-frequency signal interference nearby, stay away from the source of interference or modify the frequency and channel to avoid interference;
- Poor power supply may also cause garbled code, it is necessary to ensure the reliability of the power supply;
- Poor or too long extension lines and feeders can also cause high bit error rates.

Chapter 10 Welding Work Guidance

This product is an in-line module, welding personnel must work in accordance with the discharge operation specifications when welding the module;

This product is an electrostatic sensitive product, and if the module is not welded according to fouls, the module may be permanently damaged.

Chapter 11 Related Models

| Product model	Chip solution	Carrier frequency Hz	Transmit power dBm	Test distance km	Air rate Bps	Encapsulated form	Product size mm	Features
E34-2G4D20D	nRF24L01+	2.4G	20	2.0	250k～2M	In-line	21 * 36	Full-duplex, file transfer
E34-2G4H20D	nRF24L01+	2.4G	20	2.5	250k～2M	In-line	21 * 36	Automatic frequency hopping and anti-interference
E34-2G4H27D	nRF24L01+	2.4G	27	5.0	250k～2M	In-line	21 * 36	Automatic frequency hopping

							and
							anti-interference

Chapter 12 Antenna Guide

Antenna is an important role in the communication process, often inferior antenna will have a great impact on the communication system, so our company recommends some antennas as supporting our wireless modules and performance is better and more reasonable price.

Product model	type	Band	gain	size	Feeder	interface	peculiarity
		Hz	dBi	mm	cm		
TX2400-NP-5010	Flexible antenna	2.4G	2.0	10x50	-	IPEX	Flexible FPC soft antenna
TX2400-JZ-3	Glue rod antenna	2.4G	2.0	30	-	SMA-J	Ultra-short straight, omnidirectional antenna
TX2400-JZ-5	Glue rod antenna	2.4G	2.0	50	-	SMA-J	Ultra-short straight, omnidirectional antenna
TX2400-JW-5	Glue rod antenna	2.4G	2.0	50	-	SMA-J	Fixed bent, omnidirectional antenna
TX2400-JK-11	Glue rod antenna	2.4G	2.5	110	-	SMA-J	Bending glue rod, omnidirectional antenna
TX2400-JK-20	Glue rod antenna	2.4G	3.0	200	-	SMA-J	Bending glue rod, omnidirectional antenna
TX2400-XPL-150	Suction cup antenna	2.4G	3.5	150	150	SMA-J	Small suction cup antenna, cost-effective

Chapter 13 Bulk Packaging Methods

Unit: mm
Each Tray: 1000 pcs
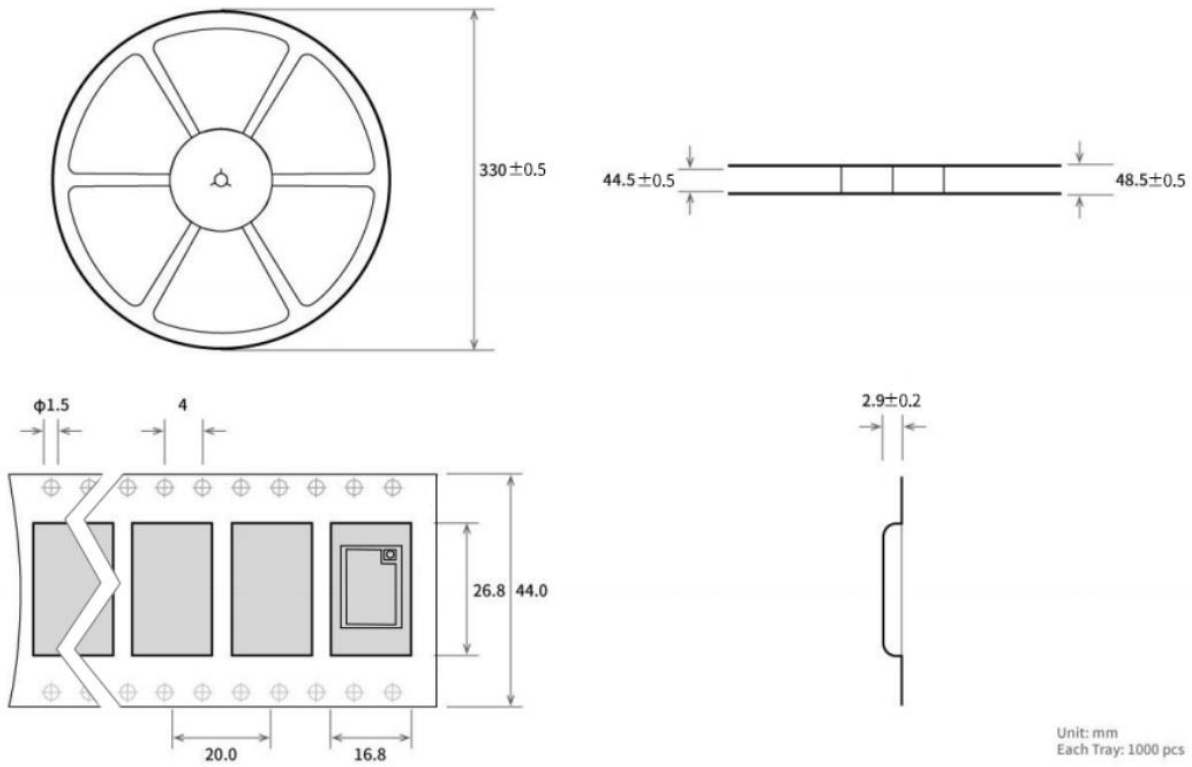
Revision history

version	Revision date	Revision description	Maintainers
v1.0	2022-9-19	Initial version	Yan
V1.1	2023-9-26	error corrected	Bin

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